Having described the invention, what is claimed is:

1. **A plate-type reformer for reforming a reactant into reaction species during operation, said reformer comprising:**

a plurality of catalyst plates having associated therewith one or more catalyst materials for promoting reformation and a plurality of conductive plates formed of a thermally conducting material, said catalyst plates and said conductive plates being alternately stacked to form a reforming structure, the conductive plates conductively transferring heat energy in-plane to support the reforming process.

2. The reformer of claim 1 wherein said reforming process includes one or more reforming reactions, said reforming reactions including a catalytically assisted chemical reaction between two or more reaction species, and a catalytically assisted thermal dissociation of a single species.

3. The reformer of claim 1 wherein said reforming structure includes at least one axial manifold for introducing the reactant thereto and at least one manifold for allowing the reaction species to exit from the reforming structure.

4. The reformer of claim 1 wherein said reforming structure has an exposed peripheral surface for exchanging heat energy with an external environment.

5. The reformer of claim 1 wherein said reforming structure includes at least one axial reactant manifold for introducing the reactant thereto and peripheral exhaust means for exhausting the reaction species from a peripheral portion of the reforming structure.

6. The reformer of claim 1 further comprising

a thermally conductive, gas-tight housing disposed about the stacked reforming structure to form a peripheral axial manifold, and

means for allowing the reaction species to enter the peripheral axial manifold, wherein the reaction species is captured by the gas-tight housing.

7. The reformer of claim 1 further including a thermally conductive, gas-tight housing having means for exchanging heat energy with the external environment and said conductive plate by one of radiation, conduction and convection.

8. The reformer of claim 1 wherein an outer surface of the reforming structure contacts an inner surface of a gas-tight housing, said gas-tight housing being capable of conductively transferring heat energy to the conductive plates.

9. The reformer of claim 1 further comprising a gas-tight enclosure of cylindrical configuration for permitting pressurized reformer operation.

10. The reformer of claim 1 wherein the conductive plate includes means for providing a generally isothermal condition, in plane of the conductive plate.

11. The reformer of claim 1 wherein said reforming structure includes at least one axial reactant manifold for introducing the reactant thereto, and wherein the conductive plates includes extension means integrally formed thereon and extending into the axial reactant manifold for preheating an incoming reactant.

12. The reformer of claim 1 wherein at least one of the conductive plate and the catalyst plate includes an in-plane surface having passage means for allowing the reactant to flow over the surface of the plate.

13. The reformer of claim 1 further including
an axial manifold formed within the reforming structure,

passage means formed between the conductive plate and the catalyst plate, and

means for generating a reactant flow pressure drop through the passage means between the conductive plate and the catalyst plate that is substantially greater than the reactant flow pressure drop within the axial manifold.

14. The reformer of claim 1 further including passage means formed between the catalyst and conductive plates for allowing an incoming reactant to pass over a surface of one of the plates, said passage means maintaining a substantially uniform pressure drop to provide for a substantially uniform flow of reactants along an axis of the reforming structure.

15. The reformer of claim 1 further including means for producing a substantially uniform temperature condition along an axis of the reforming structure.

16. The reformer of claim 1 wherein the catalyst plate is formed of a porous catalyst material, the porous material forming passage means for allowing an incoming reactant to pass through at least a portion of the plate.

17. The reformer of claim 1 wherein the thermally conductive plate is formed of a porous conductive material, the porous material forming passage means for allowing an incoming reactant to pass through the plate.

18. The reformer of claim 1 wherein the conductive plate is composed of at least one of a nonmetal such as silicon carbide, and a composite material.

19. The reformer of claim 1 wherein the conductive plate is composed of at least one metal such as aluminum, copper, iron, steel alloys, nickel, nickel alloys, chromium, chromium alloys, platinum, and platinum alloys.

20. The reformer of claim 1 wherein the catalyst plate is composed of a ceramic support plate having the catalyst material coating.

21. The reformer of claim 1 wherein the catalyst material is selected from the group consisting of platinum, palladium, nickel, nickel oxide, iron, iron oxide, chromium, chromium oxide, cobalt, cobalt oxide, copper, copper oxide, zinc, zinc oxide, molybdenum, molybdenum oxide, and other suitable transition metals and their oxides.

22. The reformer of claim 1 wherein the catalyst plate is composed of at least one of platinum, nickel, nickel oxide, chromium and chromium oxide.

23. The reformer of claim 1 wherein the reactant includes a hydrocarbon species, and at least one of O_2, H_2O and CO_2.

24. The reformer of claim 1 wherein the reactant includes at least one of an alkane, a hydroxyl, a hydrocarbon bonded with a carboxyl, a hydrocarbon bonded with a carbonyl, an olifin hydrocarbon, a hydrocarbon bonded with an ether, a hydrocarbon bonded with an ester, a hydrocarbon bonded with an amine, a hydrocarbon bonded with an aromatic derivative, and a hydrocarbon bonded with another organo-derivative.

25. **The reformer of claim 1 further including means for coupling the reaction species exiting the reformer to an external fuel cell.**

26. The reformer of claim 23 wherein the hydrocarbon fuel and at least one of H_2O and CO_2 undergo an endothermic catalytic reformation to produce H_2, CO, H_2O and CO_2, the energy requirements for the endothermic reforming being supplied by energy produced by an external fuel cell, said energy being transferred from the fuel cell by the conducting plate through in-plane thermal conduction.

27. The reformer of claim 23 wherein the hydrocarbon fuel and O_2 undergo catalytic combustion and reformation to produce H_2, CO, H_2O and CO_2, and at least one of an exothermic combustion and an exothermic reaction of an_external fuel cell supplementing the energy requirements for the endothermic reforming through the in-plane thermal conduction of the conducting plate.

28. The reformer of Claim 23 or 24 wherein the CO and H_2O undergo catalytic shift reaction to form CO_2 and H_2.

29. The reformer of claim 1 wherein the reforming structure has a substantially cylindrical shape.

30. The reformer of claim 1 wherein the reforming structure is cylindrical and at least one of the catalyst plate and the conductive plate has a diameter between about 1 inch and about 20 inches, and has a thickness between about 0.002 inch and about 0.2 inch.

31. The reformer of claim 1 wherein the reforming structure has a substantially rectangular shape.

32. A reformer for reforming a reactant into reaction species during operation, said reformer comprising:

a porous and thermally conductive material interspersed with one or more catalyst materials to form a reforming structure, the thermally conductive material transferring heat energy to support the reforming process.

33. **A plate-type reformer for reforming a reactant into reaction species during operation, said reformer comprising:**

a plurality of plates composed of a thermally conductive material interspersed with one or more catalyst materials for promoting the reforming process, said plates being stacked together to form a reforming structure, the plates conductively transferring heat energy in-plane of the plates to support the reforming process.

34. The reformer of claims 32 or 33 wherein said reforming structure includes at least one axial manifold for introducing the reactant thereto and at least one manifold for allowing the reaction species to exit from the reforming structure.

35. The reformer of claims 32 or 33 wherein said reforming structure has an exposed peripheral surface for exchanging heat energy with an external environment.

36. The reformer of claims 32 or 33 wherein said reforming structure includes at least one axial reactant manifold for introducing the reactant thereto and peripheral exhaust means for exhausting the reaction species from a peripheral portion of the reforming structure.

37. The reformer of claims 32 or 33 further comprising

a thermally conductive, gas-tight housing disposed about the reforming structure to form a peripheral axial manifold, and

means for allowing the reaction species to enter the peripheral axial manifold, wherein the reaction species is captured by the gas-tight housing.

38. The reformer of claims 32 or 33 further including a thermally conductive, gas-tight housing having means for exchanging heat energy with the external environment and said reforming structure by one of radiation, conduction and convection.

39. The reformer of claims 32 or 33 wherein an outer surface of the reforming structure contacts an inner surface of a gas-tight housing, said gas-tight housing being capable of conductively transferring heat energy to the reforming structure.

40. The reformer of claims 32 or 33 further comprising a gas-tight enclosure of cylindrical configuration for permitting pressurized reformer operation.

41. The reformer of claims 32 or 33 wherein the reforming structure includes means for providing a generally isothermal condition through said reforming structure.

42. The reformer of claims 32 or 33 wherein said reforming structure includes at least one axial reactant manifold for introducing a reactant thereto, and wherein the reforming structure includes extension means integrally formed therewith and extending into the axial reactant manifold for preheating the reactant.

43. The reformer of claims 32 or 33 wherein said reforming structure includes passage means for allowing a reactant to flow through the structure.

44. The reformer of claims 32 or 33 further including

an axial manifold formed within the reforming structure,

reactant passage means for allowing a reactant to flow in-plane of the reforming structure, and

means for generating a reactant flow pressure drop through the passage means that is substantially greater than the reactant flow pressure drop within the axial manifold.

45. The reformer of claim 43 wherein the passage means maintains a substantially uniform pressure drop to provide for a substantially uniform flow of reactants along an axis of the reforming structure.

46. The reformer of claims 32 or 33 further including means for producing a substantially uniform temperature condition along an axis of the reforming structure.

47. The reformer of claims 32 or 33 wherein the conductive material is composed of at least one of a nonmetal such as silicon carbide, and a composite material.

48. The reformer of claims 32 or 33 wherein the conductive material is composed of at least one metal such as aluminum, copper, iron, steel alloys, nickel, nickel alloys, chromium, chromium alloys, platinum, and platinum alloys.

49. The reformer of claims 32 or 33 wherein the catalyst material is selected from the group consisting of platinum, palladium, nickel, nickel oxide, iron, iron oxide, chromium, chromium oxide, cobalt, cobalt oxide, copper, copper oxide, zinc, zinc oxide, molybdenum, molybdenum oxide, other transition metals and their oxides.

50. The reformer of claims 32 or 33 wherein the reactant includes a hydrocarbon species, and at least one of O_2, H_2O and CO_2.

51. The reformer of claims 32 or 33 further including means for coupling the reaction species exiting the reformer to an external fuel cell.

52. The reformer of claims 32 or 33 wherein the reactant includes a hydrocarbon fuel and at least one of H_2O and CO_2 which undergo catalytic reformation to produce H_2, CO, H_2O and CO_2, and wherein an exothermic reaction of an external fuel cell supplements the energy requirements for the endothermic reforming reaction of the reforming structure through the thermally conductive material.

53. The reformer of claims 32 or 33 wherein the reactant includes a hydrocarbon fuel and O_2 which undergo catalytic combustion and reformation to produce H_2, CO, H_2O and CO_2, and at least one of an exothermic combustion and an exothermic reaction of an external fuel cell supplements the energy requirements for the endothermic reforming reaction of the reforming structure through the thermally conductive material.

54. The reformer of claims 32 or 33 wherein the reforming structure has a substantially cylindrical shape.

55. The reformer of claims 32 or 33 wherein the reforming structure is cylindrical and has a diameter between about 1 inch and about 20 inches.

56. The reformer of claims 32 or 33 wherein the reforming structure has a substantially rectangular shape.

57. A burner for oxidizing a hydrocarbon fuel to produce heat energy, said burner comprising:

a plurality of conductive plates formed of a thermally conductive material and a plurality of catalyst plates having one or more oxidizing catalyst materials, said catalyst plates and said conductive plates being alternately stacked to form a burner structure;

wherein the catalyst material of the catalyst plate promotes the oxidation of the hydrocarbon fuel to form a resultant species; and

wherein the conductive plates are capable of transferring heat energy produced during the oxidation process to the surrounding medium by one of radiation, conduction and convection.

58. The burner of claim 57 wherein the burner structure has an exposed peripheral surface for exchanging heat energy with an external environment.

59. The burner of claim 57 wherein said burner structure includes at least one axial reactant manifold for introducing the reactant thereto and peripheral exhaust means for exhausting the reaction species from a peripheral portion of the burner structure.

60. The burner of claim 57 further including a thermally conductive housing disposed about the burner structure and having means for exchanging heat energy with the external environment and said conductive plate by one of radiation, conduction and convection.

61. The burner of claim 57 wherein an outer surface of the burner structure contacts an inner surface of a thermally conductive housing disposed about the burner structure, said housing conductively transferring heat energy from the conductive plates during operation.

62. The burner of claim 57 wherein the conductive plate includes means for providing a generally isothermal condition, in plane of the conductive plate.

63. The burner of claim 57 wherein said burner structure includes at least one axial reactant manifold for introducing the reactant thereto, and wherein the conductive plates include extension means integrally formed thereon and extending into the axial reactant manifold for preheating the hydrocarbon fuel.

64. The burner of claim 57 wherein an in-plane surface of at least one of the conductive plate and the catalyst plate includes passage means for allowing the hydrocarbon fuel to flow over the surface of the plate.

65. The burner of claim 57 further including

an axial manifold formed within the burner structure,

passage means formed in an in-plane surface of one of the conductive plate and the catalyst plate for allowing the fuel to flow over the surface of the plate, and

means for generating a reactant flow pressure drop through the passage means that is substantially greater than the reactant flow pressure drop within the axial manifold.

66. The burner of claim 64 wherein the passage means maintains a substantially uniform pressure drop to provide for a substantially uniform flow of reactants along an axis of the burner structure.

67. The burner of claim 57 further including means for producing a substantially uniform temperature condition along an outer surface of the burner structure.

68. The burner of claim 64 wherein the catalyst plate is formed of a porous catalyst material, the porous material forming the passage means and allowing the reactant to pass through the plate.

69. The burner of claim 64 wherein the thermally conductive plate is formed of a porous conductive material, the porous material forming the passage means and allowing the reactant to pass through the plate.

70. The burner of claim 57 wherein the conductive plate is composed of silicon carbide.

71. The burner of claim 57 wherein the conductive plate is composed of at least one refractory metal.

72. The burner of claim 57 wherein the catalyst plate is composed of a ceramic support plate having the catalyst material coated thereon.

73. The burner of claim 72 wherein the catalyst coating is selected from the group consisting of at least one of platinum, nickel, nickel oxide, chromium and chromium oxide.

74. The burner of claim 57 wherein the catalyst plate is composed of at least one of platinum, nickel, nickel oxide, chromium and chromium oxide.

75. The burner of claim 57 wherein the hydrocarbon fuel is pre-mixed with an oxidizer reactant prior to introduction to or within the axial manifold.

76. The burner of claim 57 wherein the burner structure has a substantially cylindrical shape.

77. The burner of claim 57 wherein the burner structure is cylindrical and at least one of the catalyst plate and the conductive plate has a diameter between about 1 inch and about 20 inches, and has a thickness between about 0.002 inch and about 0.2 inch.

78. A burner for oxidizing a hydrocarbon fuel to produce heat energy, said apparatus comprising:

a porous and thermally conductive material interspersed with one or more catalyst materials to form a burner structure,

wherein the catalyst material promotes the oxidation of the hydrocarbon fuel to form a resultant species, and

wherein the conductive material is capable of transferring heat energy produced during the oxidation process to the surrounding medium by one of radiation, conduction and convection.

79. A burner for oxidizing a hydrocarbon fuel to produce heat energy, said apparatus comprising:

a plurality of plates composed of a thermally conductive material interspersed with one or more catalyst materials, said plates being stacked together to form a burner structure,

wherein the catalyst material promotes the oxidation of the hydrocarbon fuel to form a resultant species, and

wherein the conductive material transferring heat energy produced during the oxidation process to the surrounding medium by one of radiation, conduction and convection.

80. An electrochemical converter, comprising:

a plurality of gas-tight electrolyte plates having reactive materials disposed on both sides thereof, said plates having a fuel flow side and having the reactive material disposed thereon selected from the group consisting of at least one of a combustion catalyst, a reforming catalyst, a shift catalyst and a fuel electrode material,

said plates having an oxidant flow having the reactive material disposed thereon selected from the group consisting of an oxidant electrode material,

a plurality of gas-tight conductive plates formed of a thermally conductive material; said electrolyte plates and said conductive plates being alternately stacked together to form a stacked plate assembly, and

internal reforming means for preheating and reforming a hydrocarbon fuel on the fuel flow side of the electrolyte plate within the stacked plate assembly, said reforming being assisted by the conductive plates which are capable of conductively transferring heat from a fuel cell reaction portion of the stacked plate assembly.

81. The electrochemical converter of claim 80 wherein the electrolyte plate forms a medium for the generation of an electrolytic ionic transfer reaction.

82. The electrochemical converter of claim 80 wherein the converter performs chemical transformation and production while consuming oxygen to produce electricity.

83. The electrochemical converter of claim 80 wherein a side of the conductive plate faces the fuel flow side having disposed thereon at least one of the combustion catalyst, the reforming catalyst and the shift catalyst.

84. The electrochemical converter of claim 80 wherein at least one of the combustion catalyst, the reforming catalyst and the shift catalyst can be applied on a flow adjustment element, said flow adjustment element being situated between the electrolyte plate and the conductive plate.

85. The electrochemical converter of claim 80 further comprising a plurality of axial manifolds formed in the stacked plate assembly, at least one of the manifolds being adapted to receive a hydrocarbon fuel reactant and to allow the fuel to flow over one surface of the electrolyte plate and to exit at the external edge of the plates; and at least one other of said manifolds being adapted to receive an oxidizer reactant and to allow the oxidizer flow over the other side of the electrolyte plate and to exit at the external edge of the plates.

86. The electrochemical converter of claim 80 wherein the stacked plate assembly has a rectangular configuration with an edge that is adapted to receive a hydrocarbon fuel reactant, said reactant flowing into the space over one surface of the electrolyte plates and exits from an opposing plate edge; and the third plate edge being adapted to receive an oxidizer reactant that flows into a space over the other surface of the electrolyte plate and exits from a fourth plate edge.

87. The electrochemical converter of claim 80 wherein said conducting plates include means for regulating the radial temperature distribution of the stacked plate assembly to attain a substantially in-plane isothermal condition.

88. The electrochemical converter of claim 85 wherein said manifolds providing means for regulating the uniform flow distribution into the spaces between the plates along the axis of the stacked assembly to provide an axially isothermal condition.

89. The electrochemical converter of claim 80 wherein the thermally and electrically conductive material of the interconnector plate is composed of at least a nonmetal.

90. The electrochemical converter of claim 80 wherein the thermally and electrically conductive material of the interconnector plates is composed of at least one of nickel, nickel alloys, chromium, chromium alloys, platinum, and platinum alloys.

91. The electrochemical converter of claim 80 wherein the thermally and electrically conductive material of the interconnector plate is composed of at least one of aluminum, copper, iron, and steel alloys.

92. The electrochemical converter of claim 80 wherein the fuel electrode is composed of at least one of nickel, a nickel containing compound, chromium and chromium containing compound.

93. The electrochemical converter of claim 80 wherein the combustion catalyst is composed of at least one of platinum, platinum compound, nickel and nickel compound.

94. The electrochemical converter of claim 80 wherein the reforming catalyst is composed of at least one of nickel, a nickel containing compound, chromium and a chromium containing compound.

95. The electrochemical converter of claim 80 wherein the reforming catalyst is composed of at least one of platinum, palladium, nickel, nickel oxide, iron, iron oxide, chromium, chromium oxide, cobalt, cobalt oxide, copper, copper oxide, zinc, zinc oxide, molybdenum, and molybdenum oxide.

96. The electrochemical converter of claim 80 wherein partial oxidation at a location over the combustion catalyst formed on the surface of the electrolyte plate.

97. The electrochemical converter of claim 80 wherein the internal reforming reaction occurs over the reforming catalyst on the surface of the electrolyte plate.

98. The electrochemical converter of claim 80 wherein the fuel cell reaction occurs over the fuel electrode material on the surface of the electrolyte plate.

99. The electrochemical converter of claim 80 wherein the reforming catalyst and the fuel electrode material are intermixed over the surface of the electrolyte plate to substantially simultaneously reform the fuel and create electrochemical reaction during operation.

100. The electrochemical converter of claim 80 wherein the combustion catalyst, reforming catalyst and the fuel electrode material are intermixed over the surface of the electrolyte plate to substantially simultaneously initiate partial oxidation and reformation of a fuel reactant.

101. The electrochemical converter of claim 80 wherein a hydrocarbon fuel introduced to the converter catalytically reforms in the presence of H_2O, the fuel to produce H_2 and CO, said reformed fuel being subjected to a fuel cell reaction to form an exhaust species containing H_2O and CO_2; wherein the heat from the exothermic fuel cell reaction is conductively transferred in-plane to the conductive plates to support the endothermic reforming reaction.

102. The electrochemical converter of claim 80 wherein a hydrocarbon fuel introduced to the converter catalytically combusts partially with O_2 to produce H_2 and CO, said partially combusted fuel being subjected to an exothermic fuel cell reaction to form an exhaust species containing H_2O and CO_2, wherein the heat generated from the exothermic fuel cell reaction is conductively transfer. ed in-plane to the conducting plates to provide a temperature sufficient to support the mild exothermic partial oxidation reforming reaction.

103. The electrochemical converter of claim 80 wherein the reactant includes at least one of an alkane hydroxyl, a hydrocarbon bonded with a carboxyl, a hydrocarbon bonded with a carbonyl, an olifin hydrocarbon, a hydrocarbon bonded with an ether, a hydrocarbon bonded with an ester, a hydrocarbon bonded with an amine, a hydrocarbon bonded with an aromatic derivative, and a hydrocarbon bonded other organo-derivatives.

104. The electrochemical converter of claim 80 wherein the converter is a fuel cell selected from the group consisting of solid oxide fuel cell, molten carbonate fuel cell, alkaline fuel cell, proton exchange membrane fuel cell, and phosphoric acid fuel cell.

105. The electrochemical converter of claim 80 wherein one side of the electrolyte plate is composed of one of a zirconia based materials and a ceria based material.

106. The electrochemical converter of claim 80 further including internal reactant heating means disposed within one of the manifolds for heating at least a portion of at least one of said reactants passing through said manifold.

107. The electrochemical converter of claim 106 wherein said internal reactant heating means comprises a thermally conductive and integrally formed extended surface of said conductive plate that protrudes into at least one of said manifolds.

108. The electrochemical converter of claim 107 wherein said fuel cell reaction generates waste heat which heats said reactants to about said operating temperature, said waste heat being conductively transferred to said reactants by said interconnect plate and said extended surface.

109. The electrochemical converter of claim 80 further including peripheral exhaust means for exhausting the reformed fuel from a peripheral portion of the stacked plate assembly.

110. The electrochemical converter of claim 80 wherein at least one of the conductive plate and the electrolyte plate includes reactant passage means for allowing the reactant to pass from the axial reactant manifold over the surface of the plates.

111. The electrochemical converter of claim 110 wherein the passage means includes means for maintaining a substantially uniform pressure drop over at least one surface of the plates to provide for a substantially uniform flow of reactant over the plate surfaces.

112. The electrochemical converter of claim 110 wherein the reactive coating of the electrolyte plate is porous, the porous coating forming the reactant passage means.

113. The electrochemical converter of claim 80 further including means for generating a reactant flow pressure drop through a space formed between the conductive plate and the opposing electrolyte plate that is substantially greater than the reactant flow pressure drop within the axial manifold.

114. The electrochemical converter of claim 80 further including means for producing a substantially uniform radial flow distribution of reactants through said stacked plates.

115. The electrochemical converter of claim 80 wherein the stacked plate assembly is cylindrical and at least one of the electrolyte plate and the conductive plate has a diameter between about 1 inches and about 20 inches, and has a thickness between about 0.002 inches and about 0.2 inches.

116. The reformer of claim 80 further comprising a gas-tight enclosure of cylindrical configuration configured to surround the stacked plates to permit pressurized reformer operation.

117. The electrochemical converter of claim 80 wherein the converter is an electrochemical catalytic converter which is adapted to receive electricity from a remote power source, said electricity initiating an electrochemical reaction within said converter which is adapted to reduce selected pollutants contained within the incoming reactants into benign species.

118. The electrochemical converter of claim 116 wherein the catalytic converter further includes means to receive exhaust containing selected pollutants, including NOx and hydrocarbon species, the catalytic converter including means for reducing the NOx and the hydrocarbon species into benign species, including one of N_2, O_2 and CO_2.

119. **A catalytic converter, comprising**

a plurality of gas-tight converter plates having disposed on a first hydrocarbon gas side a reactive material consisting of one of a converter catalyst and a first electrode material; and disposed on a second buffer gas side a reactive material consisting of a second electrode material;

a plurality of gas-tight conductive plates formed of a thermally conductive material; said converter plates and said conductive plates being alternately stacked together to form a converter assembly;

means for introducing a hydrocarbon gas to the hydrocarbon gas side of the converter plate and introducing a buffer gas to the second buffer gas side of the converter plate;

means for receiving electricity from a remote power source; and

means for converting the hydrocarbon gas into benign species.

120. The converter of claim 108 wherein the conductive plates includes means for attaining a generally isothermal condition in-plane of the conductive plates.

121. The converter of claim 118 wherein the converter plate is formed of a substantially gas tight electrolyte material.

122. The converter of claim 118 wherein the converter plate is a gas tight ionic conductor.

123. The converter of claim 118 wherein the electrode coatings of at least one side of the converter plate includes nickel or a nickel containing compound.

124. The converter of claim 118 wherein the electrode coatings of at least one side of the converter plate includes platinum.

125. The converter of claim 118 wherein the electrode coating of at least one side of the converter plate includes palladium.

126. The converter of claim 118 wherein electricity received by said converter initiates an electrochemical reaction which reduce selected pollutants within the hydrocarbon gas into the benign species.

127. The converter of claim 118 wherein the assembly is adapted to receive exhaust containing selected pollutants, including one of NOx and a hydrocarbon specie, the catalytic converter further including means for reducing the NOx and hydrocarbon species into benign species.